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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to organic electroluminescence devices.

[0002]

[Description of the Prior Art]Conventionally, although used as panel type light sources, such as a back light, for example, in order to make this light emitting device drive, the high tension of exchange is required for inorganic electroluminescence devices. These days came and the organic electroluminescence devices (organic electroluminescence element: organic EL device) which used organic materials for the luminescent material were developed. Appl. Phys. Lett., and [51, 913] (1987). Organic electroluminescence devices have the structure pinched between the anode and the negative pole in the thin film containing a fluorescence organic compound, and inject an electron and an electron hole (hole) into this thin film, It is an element which emits light using the light emitted when an exciton (exciton) is made to generate and this exciton is deactivated by making it recombine. organic electroluminescence devices -- severalV - several 10 -- it is a low voltage of about V direct current, and luminescence of various colors (for example, red, blue, green) is possible by being able to emit light and choosing the kind of fluorescence organic compound. The application to various light emitting devices, a display device, etc. is expected from the organic electroluminescence devices which have such a feature. However, generally, light emitting luminance is low and is not enough practically.

[0003]As how to raise light emitting luminance, the organic electroluminescence devices which used tris(8-quinolate) aluminum as a luminous layer, and used the host compound, the coumarin derivative, and the pyran derivative as a guest compound (dopant), for example are proposed. J.Appl. Phys., and [65, 3610] (1989). Bis(2-methyl-8-quinolate)(4-phenylphenolate) aluminum as a luminous layer, for example A host compound, Organic electroluminescence

devices using the acridone derivative (for example, N-methyl-2-methoxy acridone) as a guest compound are proposed (JP,8-67873,A). However, these light emitting devices are also hard to be referred to as having sufficient light emitting luminance. Now, organic electroluminescence devices which emit light to high-intensity further are desired.

[0004]

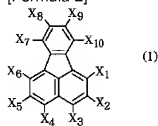
[Problem(s) to be Solved by the Invention]The technical problem of this invention is providing the organic electroluminescence devices which are excellent in luminous efficiency and emit light to high-intensity.

[0005]

[Means for Solving the Problem]This invention persons came to complete this invention, as a result of examining organic electroluminescence devices wholeheartedly. This invention to inter-electrode [of ** couple] Namely, at least one alkyl group, Organic electroluminescence devices which pinch further at least a layer containing at least one sort of fluoranthene derivatives which have an alkoxy group or an aryl group as a substituent, ** A layer containing a fluoranthene derivative which has at least one alkyl group, an alkoxy group, or an aryl group as a substituent, organic electroluminescence devices given in ** which is a luminous layer, and ** -- at least one alkyl group. In a layer containing a fluoranthene derivative which has an alkoxy group or an aryl group as a substituent. The aforementioned ** or organic electroluminescence devices given in ** containing a luminescent organometallic complex, ** Organic electroluminescence devices given in either the aforementioned ** which has a hole-injection transporting bed further in inter-electrode [of a couple] - **, ** Organic electroluminescence devices given in either the aforementioned ** which has an electron injection transporting bed further in inter-electrode [of a couple] - **, ** A fluoranthene derivative which has at least one alkyl group, an alkoxy group, or an aryl group as a substituent is related with either the aforementioned ** which is a compound expressed with a general formula (1) and the (** 2) - **, without organic electroluminescence devices of a statement.

[0006]

[Formula 2]



[X₁ - X₁₀ among a formula A hydrogen atom, a halogen atom, a straight chain, branching, or an annular alkyl group, The aryl group which is not replaced [a straight chain, branching, an

annular alkoxy group, substitution, or] is expressed. however, the inside of $X_1 - X_{10}$ -- at least one piece -- a straight chain, branching, or an annular alkyl group. the aryl group which is not replaced [a straight chain, branching, an annular alkoxy group, substitution, or] is expressed -] which may combine mutually further the alkyl group and aryl group which $X_7 - X_{10}$ adjoin, and may form the ring

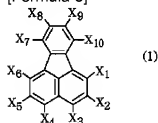
[0007]

[Embodiment of the Invention]Hereafter, this invention is explained in detail. The organic electroluminescence devices of this invention pinch further at least the layer containing at least one sort of fluoranthene derivatives which have at least one alkyl group, an alkoxy group, or an aryl group as a substituent in inter-electrode [of a couple].

[0008]The fluoranthene derivative (it is hereafter written as the compound A concerning this invention) which has at least one alkyl group, alkoxy group, or aryl group concerning this invention as a substituent, It is a compound which is a compound which has at least one alkyl group, an alkoxy group, or an aryl group as a substituent, and is preferably expressed with a general formula (1) and the (** 3) to a fluoranthene skeleton. Set with the compound expressed with a general formula (1) more preferably, and the inner 1-10 piece of $X_1 - X_{10}$ An alkyl group, It is a compound which is an alkoxy group or an aryl group, and is a compound whose 1-6 pieces are an alkyl group, an alkoxy group, or an aryl group more preferably, and 1-5 pieces are the compounds which are an alkyl group, an alkoxy group, or an aryl group still more preferably.

[0009]

[Formula 3]



[$X_1 - X_{10}$ among a formula A hydrogen atom, a halogen atom, a straight chain, branching, or an annular alkyl group, The aryl group which is not replaced [a straight chain, branching, an annular alkoxy group, substitution, or] is expressed. however, the inside of $X_1 - X_{10}$ -- at least one piece -- a straight chain, branching, or an annular alkyl group. the aryl group which is not replaced [a straight chain, branching, an annular alkoxy group, substitution, or] is expressed -] which may combine mutually further the alkyl group and aryl group which $X_7 - X_{10}$ adjoin, and may form the ring

[0010]In the compound expressed with a general formula (1), $X_1 - X_{10}$ express the aryl group which is not replaced [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group, substitution, or]. However, at least one in $X_1 - X_{10}$ expresses the aryl group which is not replaced [a straight chain branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group, substitution, or]. An aryl group expresses heterocyclic aromatic groups, such as carbocyclic aromatic groups, for example, a furil group, such as a phenyl group and a naphthyl group, a thienyl group, and a pyridyl group, for example.

[0011]Preferably $X_1 - X_{10}$ A hydrogen atom, a halogen atom. (For example, a fluorine atom, a chlorine atom and a bromine atom), a straight chain of the carbon numbers 1-16, branching or an annular alkyl group (for example, a methyl group, an ethyl group, and n-propyl group.) An isopropyl group, n-butyl group, an isobutyl group, a sec - butyl group, A tert-butyl group, n-pentyl group, an isopentyl group, a neopentyl group, A tert-pentyl group, a cyclopentyl group, n-hexyl group, 2-ethylbutyl group, A 3,3-dimethylbutyl group, a cyclohexyl group, n-heptyl group, a cyclohexylmethyl group, n-octyl group, a tert-octyl group, a 2-ethylhexyl group, n-nonyl group, n-decyl group, n-dodecyl, n-tetradecyl group, n-hexadecyl group, etc., a straight chain of the carbon numbers 1-16, branching, or an annular alkoxy group (for example, a methoxy group.) An ethoxy basis, n-propoxy group, an isopropoxy group, n-butoxy group, An isobutoxy group, a sec - butoxy group, an n-pentyloxy group, a neopentyl oxy group, a cyclopenthyloxy group, an n-hexyloxy group, 2-ethylbutoxy group, a 3,3-dimethyl butyloxy group, a cyclohexyloxy group, n-heptyloxy group, n-octyloxy group, 2-ethylhexyloxy group, n-nonyloxy group, an n-decyloxy group, n-dodecyloxy group, n-tetradecyloxy group, n-hexadecyloxy group, etc.,[0012]Or an aryl group which is not replaced [substitution of the carbon numbers 4-16, or]. for example, a phenyl group, 2-methylphenyl group, and 3-methylphenyl group. 4-methylphenyl group, 4-ethyl phenyl group, a 4-n-propyl phenyl group, 4-isopropyl phenyl group, a 4-n-buthylphenyl group, a 4-tert-buthylphenyl group, 4-isopentyl phenyl group, a 4-tert-pentyl phenyl group, A 4-n-hexyl phenyl group, 4-cyclohexyl phenyl group, a 4-n-octyl phenyl group, A 4-n-decyl phenyl group, 2, 3-dimethylphenyl group, 2, 4-dimethylphenyl group, 2, 5-dimethylphenyl group, 3, 4-dimethylphenyl group, 5-indanyl group, 1, 2, 3, a 4-tetrahydro 5-naphthyl group, 1, 2 and 3, a 4-tetrahydro 6-naphthyl group, 2-methoxypheny group, 3-methoxypheny group, 4-methoxypheny group, 3-ethoxy phenyl group, 4-ethoxy phenyl group, a 4-n-propoxy phenyl group, 4-isopropoxy phenyl group, a 4-n-butoxy phenyl group, a 4-n-pentyloxy phenyl group, a 4-n-hexyloxy phenyl group, 4-cyclohexyloxy phenyl group, A 4-n-heptyloxy phenyl group, a 4-n-octyloxy phenyl group, A 4-n-decyloxy phenyl group, a 2,3-dimethoxy phenyl group, A 2,5-dimethoxy phenyl group, a 3,4-dimethoxy phenyl group, a 2-methoxy-5-methylphenyl group, A 3-methyl-4-methoxypheny group, 2-

fluorophenyl group, 3-fluorophenyl group, 4-fluorophenyl group, 2-chlorophenyl group, a 3-chlorophenyl group, 4-chlorophenyl group, 4-bromo phenyl group, 4-trifluoro methylphenyl group, A 3,4-dichlorophenyl group, a 2-methyl-4-chlorophenyl group, A 2-chloro-4-methylphenyl group, a 3-chloro-4-methylphenyl group, A 2-chloro-4-methoxyphenyl group, 4-phenyl phenyl group, 3-phenyl phenyl group, 4-(4'-methylphenyl) phenyl group, 4-(4'-methoxyphenyl) phenyl group, Are 1-naphthyl group, 2-naphthyl group, a 4-ethoxy-1-naphthyl group, a 6-methoxy-2-naphthyl group, a 7-ethoxy-2-naphthyl group, 2-furyl group, 2-thienyl group, 3-thienyl group, 2-pyridyl group, 3-pyridyl group, 4-pyridyl group, etc., and more preferably, Are a hydrogen atom, a fluorine atom, a chlorine atom, an alkyl group of the carbon numbers 1-10, an alkoxy group of the carbon numbers 1-10, or an aryl group of the carbon numbers 6-12, and still more preferably, They are a hydrogen atom, a fluorine atom, a chlorine atom, an alkyl group of the carbon numbers 1-6, an alkoxy group of the carbon numbers 1-6, or a carbocyclic aromatic group of the carbon numbers 6-10.

[0013]An alkyl group and an aryl group which $X_7 - X_{10}$ adjoin are combined mutually, A ring may be formed, five to 7 membered-ring may be formed, for example, an alkyl group of X_8 and an aryl group of X_9 may form an indene ring with a carbon atom which was combined mutually and has been replaced, for example.

[0014]As an example of compound A concerning this invention, although the following compounds can be mentioned, this invention is not limited to these, for example.

- Illustration compound Number

1. 1-methylfluoranthene 2. 1-methyl-3-phenylfluoranthene 3. 2-methylfluoranthene 4. 3-Methyl-1-phenylfluoranthene 5. 3-methyl-10-chlorofluoranthene 6. 3-ethylfluoranthene 7. 3-cyclohexylfluoranthene 8. 7-methylfluoranthene 9. 7-n-butylfluoranthene 10. 7-methyl-8,9,10-triphenylfluoranthene 11. 7-ethyl-8,9,10-triphenylfluoranthene 12. 8-methylfluoranthene 13. 8-ethylfluoranthene 14. 1,3-dimethylfluoranthene 15. 2,3-dimethylfluoranthene 16. 2,3-Dimethyl- 1-phenylfluoranthene 17. 2,4-dimethylfluoranthene 18. 2,5-di-tert-butylfluoranthene 19. 3,4-dimethylfluoranthene 20. 3-methyl-4-ethylfluoranthene 21. 7,8-dimethylfluoranthene 22. 7,8-Di-sec-butylfluoranthene 23. 7,8-di-n-hexylfluoranthene [0015]
24. 7,10-dimethylfluoranthene 25. 7,10-diethylfluoranthene 26. 7,10-dimethyl- 8-phenylfluoranthene 27. 7,10-dimethyl- 8-(4'-methylphenyl) fluoranthene 28. 7,10-dimethyl- 8-(4'-methoxyphenyl) full orante N 29. 7,10-dimethyl- 8,9-diphenylfluoranthene 30. 7,10-dimethyl- 8-(4'-methylphenyl)-9-phenyl Fluoranthene 31. 7,10-Diethyl- 8-phenylfluoranthene 32. 7,10-diethyl- 8-(2'-methylphenyl) fluoranthene 33. 7,10-diethyl- 8-(1'-naphthyl) fluoranthene 34. 7,10-diethyl- 8-(4'-ethylphenyl)-9-phenylfluoranthene 35. 7,10-diethyl- 8-(4'-phenylphenyl)-9-Feni. RUFURUO run ten 36. 7,10-diethyl- 8-(2'-naphthyl)-9-phenyl FURUO run ten 37. 7,10-di-n-propyl-8-phenylfluoranthene 38. 7,10-di-n-propyl- 8-(3'-ME.) Chill phenyl

FURUO . Run ten 39. 7,10-di-n-propyl-8-(1'-naphthyl) full orante N 40.7,10-di-n-propyl-8,9-diphenylfluoranthene 41. 7,10-di-n-propyl-8-(4'-ethylphenyl)-9- Phenylfluoranthene 42.7,10-diisopropyl- 8,9-diphenylfluoranthene 43. 7,10-di-n-butyl 8,9 - Diphenylfluoranthene 44. 7,10-di-n-pentyl-8,9-diphenylfluoranthene . 45. 7,10-di-n-hexyl-8-(4'-phenylphenyl)-9 - phenylfluoranthene 46. 8,9-dimethylfluoranthene 47. 1,2,3-trimethyl fluoranthene 48. 1,6,7,10-tetramethyl fluoranthene . 49. 1,6-dimethyl- 7,10-diethylfluoranthene 50. 1,6,7,8,9,10-hexamethyl fluoranthene[0016]

51. 1-methoxyfluoranthene 52.2-methoxyfluoranthene 53. 3-methoxyfluoranthene 54. 3-ethoxyfluoranthene 55. 3-n-butoxyfluoranthene 56. 3-n-dodecyloxy fluoranthene . 57. 7-methoxy fluoranthene 58. 8-methoxyfluoranthene 59. 8-ethoxyfluoranthene 60. 8-n-hexyloxy fluoranthene 61. 1 - Methyl-3-methoxy fluoranthene 62. 2-methyl-4-methoxy fluoranthene . 63. 8-chloro-9-methoxy fluoranthene . 64. 8-chloro-9-ethoxyfluoranthene . 65. 9-tert-butyl-3-methoxy fluoranthene . 66. 3,9-dimethoxyfluoranthene . 67. 3,9-diethoxyfluoranthene 68. 2,3,4,5,7,8,9,10-octafluoro 1,6-JIME TOKISHI fluoranthene 69. 1,4,8-trimethoxy fluoranthene 70. 2,4,8-trimethoxy fluoranthene[0017]

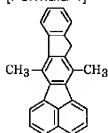
71. 2-phenylfluoranthene 72.3-phenylfluoranthene 73. 7 - Phenylfluoranthene 74. 7-(4'-ethoxyphenyl) fluoranthene 75. 8-phenylfluoranthene 76. 8-(1'-naphthyl) fluoranthene 77. 2,5-JI (3'-methylphenyl) fluoranthene . 78. 3,4-diphenylfluoranthene . 79. 7,9-diphenylfluoranthene . 80. 7,9-JI (4'-methylphenyl) fluoranthene . 81. 7,9-JI (4'-methoxyphenyl) fluoranthene 82. 7,9-diphenyl-8,10-diethylfluoranthene 83. 7,9-diphenyl-8,10-dimethoxyfluoranthene 84. 7,10-diphenylfluoranthene . 85. . 7,10-JI (4'-ethylphenyl) fluoranthene . 86. 7,10-JI (4'-tert-buthylphenyl) fluoranthene 87. 7,10-JI (2'-naphthyl) fluoranthene 88. 7,10 - Diphenyl-2-fluorofluoranthene 89. 7,10-diphenyl-8-chlorofluoranthene . 90. 7,10-diphenyl- 3,4-dimethylfluoranthene 91. 7,10-diphenyl-2-methoxy fluoranthene . 92. 7,10-diphenyl-8,9-dimethylfluoranthene 93. 7,10-diphenyl- 8,9 - Di-n-butyl fluoranthene 94. 7,10-diphenyl-8,9-di-n-hexyloxy fluoranthene . 95. 7,10-diphenyl-8,9-dichlorofluoranthene [0018]

96. 8,9-diphenylfluoranthene 97. 8,9-JI (4'-methylphenyl) fluoranthene . 98. 8,9-JI (4'-chlorophenyl) fluoranthene . 99. 3,7,10-triphenylfluoranthene 100. 7,8,10-triphenylfluoranthene 101. 7, 8, 10-Tori. (3'-methylphenyl) Fluoranthene 102. 7,8,10-Tori (4'-methylphenyl) fluoranthene 103. 7,8,10-Tori (4'-methoxyphenyl) fluoranthene 104. 7,8,10-Tori (3'-fluorophenyl) fluoranthene 105. 7,10-diphenyl-8-(4'-methylphenyl) fluoranthene 106. 7,10-diphenyl-8-(4'-methoxyphenyl) fluoran Ten 107. 7,10-diphenyl-8-(4'-chlorophenyl) full orante . N 108. 7,10-diphenyl-8-(4'-phenylphenyl) fluoran Ten 109. 7-phenyl-8,10-JI (4'-methylphenyl) full orante The N 110. 10-phenyl- 7, 8-JI (3'-methylphenyl) full orante . N 111. 10-FU. *****- 7,8-JI (3'-ethoxyphenyl) fluoran . Ten 112. 7,8,10-triphenyl-2-tert-butylfluoranthene 113. 7,8,10-triphenyl-3-chlorofluoranthene 114. 7,8,10-triphenyl-9-ethylfluoranthene 115. 7,8,10-triphenyl-

9-methoxyfluoranthene 116. 7,8,10-triphenyl-9-fluorofluoranthene 117. 7,10-diphenyl-8-(4'-ethylphenyl)-9-n-PE NCHIRU fluoranthene 118. 7,10-diphenyl-8-(4'-methylphenyl)-9-METOKI SHIFURUO run ten 119. 7,10-diphenyl-8-(2'-methylphenyl)-9-chlorofluoranthene 120. 10-phenyl-7,8-JI (4'-methylphenyl)-9-methyl . Fluoranthene[0019]
 121. 3,4,7,10-tetraphenylfluoranthene 122. 3,7,8,10 - Tetraphenylfluoranthene 123. 7,8,9,10-tetraphenylfluoranthene 124. 7,10-diphenyl- 8 and 9 - JI(4'-methylphenyl) FURUO . Run ten 125. 7,10-diphenyl-8,9-JI (4'-tert-buthylphenyl)
 Fluoranthene 126. 7,10-diphenyl-8,9-JI (4'-methoxyphenyl) full ORANTEN 127. 7,10-diphenyl-8,9-JI (3'-fluorophenyl) full ORANTEN 128. 7,10-diphenyl- 8 and 9 - JI(4'-chlorophenyl) FURUO . Run ten 129. The 7,10-diphenyl- 8, 9-JI. (1'-naphthyl) Full orante N130. 7,10-JI (4'-ethylphenyl)-8,9-diphenylfluoranthene 131. 7,10-JI (3',4'-dimethylphenyl)-8,9-diphenylfluoranthene 132. 7,10-JI (4'-methoxyphenyl)-8,9-diphenyl full . ORANTEN133. 7,9,10-triphenyl-8-(2',4'-dimethylphenyl) fluoranthene 134. 7,9,10-triphenyl-8-(2'-naphthyl) full orante N 135. 7,9,10-triphenyl- 8 - (4'-Thet 1, 2, 3) *****- 6'-naphthyl fluoranthene[0020]
 136. . 8,10-diphenyl-7,9-JI (4'-methylphenyl) FURUO Run ten 137. 8,10-diphenyl-7,9-JI (3'-ethoxyphenyl) full ORANTEN 138. 7,8,9,10-tetraphenyl-3-chlorofluoranthene 139. 7,8,9,10-tetraphenyl-2-ethylfluoranthene 140. -- the 7,8,9,10-tetraphenyl-2-methoxy fluoranthene 141. 3,7,8,9,10-pentaphenylfluoranthene 142. 3,4,7, and 8 and 9. 10-hexaphenylfluoranthene and also a following formula (143) - a formula (145) (** 4 --izing 6)
 143.

[0021]

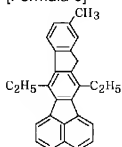
[Formula 4]



144.

[0022]

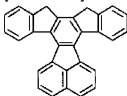
[Formula 5]



145.

[0023]

[Formula 6]



[0024]The compound A concerning this invention can be itself manufactured in accordance with a publicly known method. For example, Ber. Dtsch. Chem. Ges., and 71 and 774 (1938), Tetrahedron, 22 and 2957 (1966), Indian J. Chem. Sect.B, 15B, 32 (1977), Indian J.Chem. Sect.B, 16B, 152 (1978), Indian J. Chem. Sect.B, 19B, 750 (1980), Indian J. Chem. Sect.B, 22B, 225 (1983), Aust. J. Chem., and 21 and 2237 (1968), Curr. Sci., 40 and 463 (1971), Curr. Sci., and 45 and 254 (1976), J. Chem. Soc., 1949, 1555, J. Chem. Soc., and 1954, 227 It can manufacture according to J. Amer. Chem. Soc., 90 and 566 (1968), Liebigs Ann. Chem., 739 and 159 (1970), J. Amer. Chem. Soc., and 115 and 11542 (1993). That is, it can manufacture by making a cyclopenta[a] acenaphthylene 8-one derivative and an acetylene derivative react, and, for example, forming decarbon monoxide.

[0025]Organic electroluminescence devices usually pinch further at least a luminous layer which contains at least one sort of luminescent components in inter-electrode [of a couple]. In consideration of each functional level of a hole injection of a compound and electron hole transportation, electron injection, and electron transportation used for a luminous layer, an electron injection transporting bed containing a hole-injection transporting bed or/and an electron injection transportation ingredient containing a hole-injection transportation ingredient can also be provided according to a request. For example, when a hole-injection function of a compound used for a luminous layer, an electron hole transportation function or/and an electron injection function, and an electron transportation function are good, a luminous layer can have composition of an element of a mold which served both as a hole-injection transporting bed or/and an electron injection transporting bed. Of course, it can also have composition of an element (much more element of a mold) of a mold which does not provide a layer of both a hole-injection transporting bed and an electron injection transporting bed depending on the case. Each layer of a hole-injection transporting bed, an electron injection transporting bed, and a luminous layer may be structure much more, or may be multilayer structure, and in each layer, a hole-injection transporting bed and the electron injection transporting bed can provide independently a layer which has a pouring function, and a layer which has a transportation function, and can also constitute it.

[0026] In organic electroluminescence devices of this invention, as for compound A concerning this invention, it is preferred to use for a hole-injection transportation ingredient, luminescent components, or an electron injection transportation ingredient, it is more preferred to use for a hole-injection transportation ingredient or luminescent components, and especially its thing used for luminescent components is preferred. In organic electroluminescence devices of this invention, compound A concerning this invention may be used alone, or may be used together. [two or more]

[0027] Especially as composition of organic electroluminescence devices of this invention, it is not what is limited, For example, (A) anode / hole-injection transporting bed / luminous layer / electron injection transporting bed / negative pole type element (drawing 1), (B) The anode / hole-injection transporting bed / luminous layer / negative pole type element (drawing 2), (C) anode / luminous layer / electron injection transporting bed / negative pole type element (drawing 3), (D) anode / luminous layer / negative pole type element (drawing 4), etc. can be mentioned. A luminous layer can also be used as (E) anode / hole-injection transporting bed / electron injection transporting bed / luminous layer / electron injection transporting bed / negative pole type element (drawing 5) which is an element of a mold put by an electron injection transporting bed. (D) Although an element of a mold which made inter-electrode [of a couple] pinch only luminescent components with a gestalt further is included as element composition of a mold, An element of a mold which it made inter-electrode [of a couple] pinch more preferably with the one-layer gestalt which mixed (F) hole-injection transportation ingredient, luminescent components, and an electron injection transportation ingredient for example (drawing 6), (G) It is a gestalt of an element (drawing 8) of a mold which it made inter-electrode [of a couple] pinch with the one-layer gestalt which mixed an element (drawing 7) or (H) luminescent components, and an electron injection transportation ingredient of a mold which it made inter-electrode [of a couple] pinch with the one-layer gestalt which mixed a hole-injection transportation ingredient and luminescent components.

[0028] Organic electroluminescence devices of this invention cannot be restricted to such element composition, and a hole-injection transporting bed, a luminous layer, and a two or more layers electron injection transporting bed can be provided in each type of element. In each type of element, a mixed layer of luminescent components and an electron injection transportation ingredient can also be provided between a hole-injection transporting bed and a luminous layer between a mixed layer of a hole-injection transportation ingredient and luminescent components or/and a luminous layer, and an electron injection transporting bed. Composition of more desirable organic electroluminescence devices is (A) mold element, (B) mold element, (C) mold element, (E) mold element, (F) mold element, (G) mold element, or (H) mold element, and is (A) mold element, (C) mold element, (F) mold element, or (H) mold element still more preferably.

[0029]As organic electroluminescence devices of this invention, (A) anode / hole-injection transporting bed / luminous layer / electron injection transporting bed / negative pole type element shown in (drawing 1) are explained, for example. in (drawing 1) -- 1 -- a substrate and 2 -- a luminous layer and 5 show an electron injection transporting bed, 6 shows the negative pole, and, as for a hole-injection transporting bed and 4, the anode and 3 show a power supply 7.

[0030]As for organic electroluminescence devices of this invention, being supported by the substrate 1 is preferred, and as a substrate, Although it does not limit in particular, a transparent translucent thing which is and carries out is preferred, for example, a glass plate and a transparent plastic sheet (for example, polyester.) What consists of a composite sheet which combined sheets, such as polycarbonate, polysulfone, polymethylmethacrylate, polypropylene, and polyethylene, a translucent plastic sheet, quartz, transparent ceramics, or these can be mentioned. The luminescent color is also controllable to a substrate combining a color filter film, color conversion membrane, and a dielectric reflecting film, for example.

[0031]It is preferred to use metal with a comparatively large work function, an alloy, or an electric conductivity compound as electrode material as the anode 2. As electrode material used for the anode, gold, platinum, silver, copper, cobalt, nickel, palladium, vanadium, tungsten, tin oxide, a zinc oxide, ITO (indium Tin oxide), a polythiophene, polypyrrole, etc. can be mentioned, for example. Such electrode material may be used alone or may be used together. [two or more] The anode can form such electrode material on a substrate by methods, such as vacuum deposition and sputtering process, for example. The anode may be structure much more or may be multilayer structure. Below hundreds of ohms / ** set sheet electrical resistance of the anode as 5-50ohms / ** grade more preferably. Although thickness of the anode is based also on material of electrode material to be used, generally it is more preferably set as about 10-500 nm about 5-1000 nm.

[0032]The hole-injection transporting bed 3 is a layer containing a compound which has the function to convey an electron hole which makes easy pouring of an electron hole (hole) from the anode, and which was functioned and poured in. A compound which has compound A and/or other hole-injection transportation functions which a hole-injection transporting bed requires for this invention. for example, a phthalocyanine derivative and doria -- a reel methane derivative and doria -- a reel amine derivative. It can form using an oxazole derivative, a hydrazone derivative, a stilbene derivative, a pyrazoline derivative, a polysilane derivative, polyphenylene vinylene and its derivative, a polythiophene and its derivative, a poly-N-vinylcarbazole derivative, etc. at least one sort. A compound which has a hole-injection transportation function may be used alone, or may be used together. [two or more]

[0033]as the compound which has other hole-injection transportation functions to use in this invention -- doria -- a reel amine derivative (for example, 4,4'-screw) [N-phenyl-N-(4"-

methylphenyl) amino] Biphenyl, a 4,4'-screw [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl, a 4,4'-screw [N-phenyl-N-(3"-methoxyphenyl) amino] Biphenyl, a 4,4'-screw [N-phenyl-N-(1"-naphthyl) amino] Biphenyl, a 3,3'-dimethyl- 4,4'-screw [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl, an 1,1-screw [4"-[N,N-JI (4"-methylphenyl) amino] phenyl] Cyclohexane, a 9,10-screw [N-(4'-methylphenyl)-N-(4"-n-buthylphenyl) amino] Phenanthrene, 3,8-bis(N,N-diphenylamino)-6-phenyl phenanthridine, a 4-methyl-N,N-screw [4"4"" bis[-] [N',N'-JI (4-methylphenyl) amino] biphenyl 4-yl] Aniline, a N,N'-screw [4-(diphenylamino) phenyl] -N,N'-diphenyl-1,3-diaminobenzene, a N,N'-screw [4-(diphenylamino) phenyl] -N,N'-diphenyl-1,4-diaminobenzene, a 5,5"-screw [4-(bis[4-methylphenyl] amino) phenyl] -2,2':5',2"-TACHIOFEN, 1,3,5-tris(diphenylamino) benzene, - tris(N-carbazolyl) triphenylamine, and 4,4',4 "4, 4 and 4"-tris [N-(3""-methylphenyl)-N-phenylamino] A triphenylamine, 1 and 3, 5-tris [N-(4'-diphenylaminophenyl) phenylamino] Benzene of a polythiophene and its derivative, and a poly-N-vinylcarbazole derivative, etc. are more preferred. When using together compound A concerning this invention, and a compound which has other hole-injection transportation functions, a rate of compound A concerning this invention occupied in a hole-injection transporting bed is preferably prepared to about 0.1 to 40% of the weight.

[0034]The luminous layer 4 is a layer containing a compound which has an electron hole and electronic pouring functions, those transportation functions, and the function to make recombination of an electron hole and an electron generate an exciton. A fluorescent compound which has compound A and/or other luminescence functions which a luminous layer requires for this invention (for example, an acridone derivative, a quinacridone derivative, a polynuclear aromatic compound) [For example, rubrene, anthracene, tetracene, pyrene, perylene, A chrysene, decacyclene, coronene, a tetraphenylcyclopentadiene, A pentaphenylcyclopentadiene, 9,10-diphenylanthracene, 9,10-bis(phenylethynyl)anthracene, 1,4-bis(9'-ethynylantracenyl)benzene, 4,4'-bis(9'-ethynylantracenyl)biphenyl] doria -- a reel amine derivative [For example, a compound mentioned above as a compound which has a hole-injection transportation function can be mentioned.] Organometallic complex[For example, tris(8-quinolate) aluminum, bis(10-benzo[h] quinolate)beryllium, Zinc salt of 2-(2'-hydroxyphenyl) benzooxazol, zinc salt of 2-(2'-hydroxyphenyl) benzothiazole, Zinc salt of 4-hydroxyacridine, zinc salt of 3-hydroxyflavone, a beryllium salt of 5-hydroxyflavone, an aluminum salt of 5-hydroxyflavone] Stilbene derivative[For example, 1,1,4,4-tetraphenyl-1,3-butadiene, 4,4'-bis(2,2-diphenylvinyl)biphenyl] Coumarin derivative[for example, The coumarin 1, the coumarin 6, the coumarin 7, the coumarin 30, the coumarin 106, the coumarin 138, the coumarin 151, the coumarin 152, the coumarin 153, the coumarin 307, the coumarin 311, the coumarin 314, the coumarin 334, the coumarin 338, the coumarin 343, the coumarin 500] Pyran derivativeFor example, [DCM1, DCM2] Oxazone derivative[For example, Nile red] A benzothiazole derivative, a benzo oxazole derivative, a benzimidazole derivative, A pyrazine

derivative, a cinnamate derivative, poly-N-vinylcarbazole, and its derivative, A polythiophene and its derivative, polyphenylene, and its derivative, Polyful Oren and its derivative, polyphenylene vinylene, and its derivative, It can form using poly biphenylene vinylene and its derivative, poly terphenylene vinylene and its derivative, poly naphthylene vinylene and its derivative, poly thienylene vinylene, its derivative, etc. at least one sort. In organic electroluminescence devices of this invention, it is preferred to contain compound A which starts this invention at a luminous layer. When using together compound A concerning this invention, and a compound which has other luminescence functions, a rate of compound A concerning this invention occupied in a luminous layer, It prepares to about 0.1 to 99.9% of the weight still more preferably about 0.01 to 99.99% of the weight more preferably about 0.001 to 99.999% of the weight.

[0035]As a compound which has other luminescence functions used in this invention, a luminescent organometallic complex is more preferred. For example, a luminous layer can also consist of a host compound and a guest compound (dopant) like a statement in J. Appl. Phys., 65 and 3610 (1989), and JP,5-214332,A. A luminous layer can be formed using compound A concerning this invention as a host compound, further, it can use as a guest compound and a luminous layer can also be formed. When forming a luminous layer, using compound A concerning this invention as a guest compound, as a host compound, a luminescent organometallic complex is preferred. In this case, to a luminescent organometallic complex, compound A concerning this invention is depended and is used especially about 0.1 to 10% of the weight about 0.01 to 30% of the weight about 0.001 to 40% of the weight preferably.

[0036]Especially as a luminescent organometallic complex used together with compound A concerning this invention, although it does not limit, a luminescent organic aluminium complex is preferred and a luminescent organic aluminium complex which has 8-quinolate ligand which is not replaced [substitution or] is more preferred. As a luminescent desirable organometallic complex, a luminescent organic aluminium complex expressed with a general formula (a) - a general formula (c) can be mentioned, for example.

(Q)₃-aluminum (a)

(Q expresses among a formula 8-quinolate ligand which is not replaced [substitution or])

(Q)₂-aluminum-O-L (b)

(Q expresses a substitution 8-quinolate ligand among a formula, O-L is a phenolate ligand and L expresses a hydrocarbon group of the carbon numbers 6-24 containing phenyl moiety)

(Q)₂-aluminum-O-aluminum-(Q)₂ (c)

(Q expresses a substitution 8-quinolate ligand among a formula)

[0037]As an example of a luminescent organometallic complex, for example Tris(8-quinolate) aluminum, Tris(4-methyl-8-quinolate) aluminum, tris(5-methyl-8-quinolate) aluminum, Tris(3,4-

dimethyl- 8-quinolate) aluminum, tris(4,5-dimethyl- 8-quinolate) aluminum, Tris(4,6-dimethyl- 8-quinolate) aluminum, bis(2-methyl-8-quinolate)(phenolate) aluminum, Bis(2-methyl-8-quinolate)(2-methylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3-methylphenolate) aluminum, Bis(2-methyl-8-quinolate)(4-methylphenolate) aluminum, bis(2-methyl-8-quinolate) (2-phenylphenolate) aluminum, bis(2-methyl-8-quinolate)(3-phenylphenolate) aluminum, [0038] Bis(2-methyl-8-quinolate)(4-phenylphenolate) aluminum, Bis(2-methyl-8-quinolate)(2,3-dimethylphenolate) aluminum, Bis(2-methyl-8-quinolate)(2,6-dimethylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3,4-dimethylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3,5-dimethylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3,5-di-tert-butylphenolate) aluminum, Bis(2-methyl-8-quinolate)(2,6-diphenylphenolate) aluminum, Bis(2-methyl-8-quinolate)(2,4,6-triphenylphenolate) aluminum, Bis(2-methyl-8-quinolate)(2,4,6-trimethyl phenolate) aluminum, Bis(2-methyl-8-quinolate)(2,4,5,6-tetramethyl phenolate) aluminum, bis(2-methyl-8-quinolate) (1-naphtho RATO) aluminum, Bis(2-methyl-8-quinolate)(2-naphtho RATO) aluminum, Bis(2,4-dimethyl- 8-quinolate)(2-phenylphenolate) aluminum, Bis(2,4-dimethyl- 8-quinolate)(3-phenylphenolate) aluminum, Bis(2,4-dimethyl- 8-quinolate)(4-phenylphenolate) aluminum, Bis(2,4-dimethyl- 8-quinolate)(3,5-dimethylphenolate) aluminum, bis(2,4-dimethyl- 8-quinolate) (3,5-di-tert-butylphenolate) aluminum, [0039]Bis(2-methyl-8-quinolate)aluminum mu-oxo bis(2-methyl-8-quinolate)aluminum, Bis(2,4-dimethyl- 8-quinolate)aluminum mu-oxo bis(2,4-dimethyl- 8-quinolate)aluminum, Bis(2-methyl-4-ethyl-8-quinolate)aluminum mu-oxo bis(2-methyl-4-ethyl-8-quinolate)aluminum, Bis(2-methyl-4-methoxy-8-quinolate)aluminum mu-oxo bis(2-methyl-4-methoxy-8-quinolate)aluminum, Bis(2-methyl-5-cyano 8-quinolate)aluminum mu-oxo bis(2-methyl-5-cyano 8-quinolate)aluminum, Bis(2-methyl-5-trifluoromethyl 8-quinolate)aluminum mu-oxo bis(2-methyl-5-trifluoromethyl 8-quinolate)aluminum etc. can be mentioned. Of course, a luminescent organometallic complex may be used alone or may be used together. [two or more]

[0040]The electron injection transporting bed 5 is a layer containing a compound which has the function to convey an electron which makes pouring of an electron from the negative pole easy, and which was functioned and poured in. A compound which has compound A and/or other electron injection transportation functions which an electron injection transporting bed requires for this invention (for example, organometallic complex) [For example, tris(8-quinolate) aluminum, bis(10-benzo[h] quinolate)beryllium] It can form using an oxadiazole derivative, a triazole derivative, a triazine derivative, a perylene derivative, a quinoline derivative, a quinoxaline derivative, a diphenyl quinone derivative, a nitration fluorenone derivative, a thiopyran dioxide derivative, etc. at least one sort. When using together compound A concerning this invention, and a compound which has other electron injection transportation functions, a rate of compound A concerning this invention occupied in an electron injection transporting bed is preferably prepared to about 0.1 to 40% of the weight.

Compound A and an organometallic complex which start this invention in this invention It is preferred to use together [for example, a compound expressed with said general formula (a) - a general formula (c)], and to form an electron injection transporting bed.

[0041]It is preferred to use metal with a comparatively small work function, an alloy, or an electric conductivity compound as electrode material as the negative pole 6. As electrode material used for the negative pole, for example Lithium, a lithium indium alloy, Sodium, a sodium potassium alloy, calcium, magnesium, A magnesium silver alloy, a magnesium indium alloy, indium, A ruthenium, titanium, manganese, yttrium, aluminum, an aluminium-lithium alloy, an aluminum calcium alloy, an aluminum magnesium alloy, a graphite thin film, etc. can be mentioned. Such electrode material may be used alone or may be used together. [two or more]

[0042]The negative pole can form such electrode material on an electron injection transporting bed by methods, such as vacuum deposition, sputtering process, ionization vacuum deposition, the ion plating method, and the ionized cluster beam method, for example. The negative pole may be structure much more, or may be multilayer structure. As for sheet electrical resistance of the negative pole, it is preferred to set to below hundreds of ohms / **. Although thickness of the negative pole is based also on material of electrode material to be used, generally it is more preferably set as about 10-500 nm about 5-1000 nm. In order to take out luminescence of organic electroluminescence devices efficiently, a translucent thing with at least one transparent electrode of the anode or the negative pole which is and carries out is preferred, and it is more preferred to set up material of the anode and thickness generally, so that transmissivity of luminescent light may be not less than 70%.

[0043]moreover -- in organic electroluminescence devices of this invention -- the -- a singlet oxygen quencher may contain in inside further at least. Especially as a singlet oxygen quencher, it does not limit, rubrene, a nickel complex, diphenylisobenzofuran, etc. are mentioned, for example, and it is rubrene especially preferably. Especially as a layer which a singlet oxygen quencher contains, although it does not limit, it is a luminous layer or a hole-injection transporting bed, and is a hole-injection transporting bed more preferably. For example, when making a hole-injection transporting bed contain a singlet oxygen quencher, it may be made to contain uniformly in a hole-injection transporting bed, and may be made to contain near the layer (for example, a luminous layer, an electron injection transporting bed which has a luminescence function) which adjoins a hole-injection transporting bed. 0.01- of entire volume which constitutes a layer (for example, hole-injection transporting bed) to contain as content of a singlet oxygen quencher -- it is 0.1 to 20 % of the weight more preferably 0.05 to 30% of the weight 50% of the weight.

[0044]About a formation method of a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, It is producible not a thing limited especially but by, for

example, forming a thin film by a vacuum deposition method, ionization vacuum deposition, and the solution applying methods (for example, a spin coat method, the cast method, a dip coating method, the bar coat method, the roll coat method, a Langmuir-Blodgett method, etc.). When forming each class with a vacuum deposition method, conditions of vacuum deposition, Although it does not limit in particular, it is preferred under a vacuum below a 10^{-5} -Torr grade to carry out with an evaporation rate of about 0.005-50nm/sec with boat temperature (deposition source temperature) of about 50-400 °C and about [-50-300 °C] substrate temperature. In this case, each class, such as a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, can manufacture organic electroluminescence devices which were further excellent in various characteristics by forming continuously under a vacuum. When forming each class, such as a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, with a vacuum deposition method using two or more compounds, it is preferred to carry out temperature control of each boat into which a compound was put individually, and to carry out vapor codeposition.

[0045]By the solution applying method, when you form each class, a solvent is dissolved or distributed and let an ingredient which forms each class, its ingredient, binder resin, etc. be coating liquid. As binder resin which can be used for each class of a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, For example, poly-N-vinylcarbazole, polyarylate, polystyrene, Polyester, a polysiloxane, polymethyl acrylate, polymethylmethacrylate, Polyether, polycarbonate, polyamide, polyimide, polyamidoimide, Poly paraxylene, polyethylene, polyphenylene oxide, polyether sulphone, High molecular compounds, such as poly aniline and its derivative, a polythiophene and its derivative, polyphenylene vinylene and its derivative, Polyful Oren and its derivative, poly thienylene vinylene, and its derivative, are mentioned. Binder resin may be used alone or may be used together. [two or more]

[0046]When forming each class by the solution applying method, an ingredient which forms each class, its ingredient, binder resin, etc., a suitable organic solvent (for example, hexane, octane, Deccan, and toluene.) Hydrocarbon system solvents, such as xylene, ethylbenzene, and 1-methylnaphthalene, For example, acetone, methyl ethyl ketone, methyl isobutyl ketone, Ketone solvent, for example, dichloromethane, such as cyclohexanone, chloroform, Tetrachloromethane, a dichloroethane, trichloroethane, tetrachloroethane, Halogenated hydrocarbon system solvents, such as chlorobenzene, dichlorobenzene, and chlorotoluene, For example, ester solvent, such as ethyl acetate, butyl acetate, and amyl acetate, For example, methanol, propanol, butanol, a pentanol, a hexanol, Alcoholic solvent, such as cyclohexanol, methyl cellosolve, ethylcellosolve, and ethylene glycol, For example, ether system solvents, for example, N,N-dimethylformamide, such as dibutyl ether, a tetrahydrofuran, dioxane, and an anisole, N,N-dimethylacetamide, a 1-methyl-2-pyrrolidone,

1,3-dimethyl-2-imidazolidinone, A polar solvent and/or water, such as dimethyl sulfoxide, can be dissolved or distributed, it can be considered as coating liquid, and a thin film can be formed by various kinds of applying methods.

[0047]Although it does not limit especially as a method of distributing, it can distribute in the shape of a particle using a ball mill, a sand mill, a paint shaker, attritor, a homogenizer, etc., for example. It cannot limit, can be set as a density range which was suitable for producing desired thickness by the applying method to enforce, especially concerning concentration of coating liquid, and, generally is about 1 to 30% of the weight of solution concentration preferably about 0.1 to 50% of the weight. Concerning the amount used, when using binder resin, Although it does not limit in particular, generally it sets up to about 15 to 90% of the weight more preferably about 10 to 99% of the weight about 5 to 99.9% of the weight to an ingredient which forms each class (receiving a total amount of each ingredient, in forming an element of a mold further).

[0048]Although it does not limit especially concerning thickness of a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, generally it is preferred to set it as 5 nm - about 5 micrometers. For the purpose of preventing contact with oxygen, moisture, etc. to a produced element. A protective layer (sealing layer) can be provided, and an element can be enclosed in inactive substances, such as paraffin, a liquid paraffin, a silicone oil, a fluorocarbon oil, and a zeolite content fluorocarbon oil, for example, and can be protected. As a material used for a protective layer, for example A charge of an organic high polymer material. for example, fluorination resin, an epoxy resin, silicone resin, and epoxy silicone resin. Polystyrene, polyester, polycarbonate, polyamide, polyimide, Polyamidoimide, poly paraxylene, polyethylene, polyphenylene oxide, An inorganic material (for example, diamond membrane, amorphous silica, and electric insulation glass, a metallic oxide, metal nitride, a graphitized carbon ghost, metallic sulfide) and material which can mention a photo-setting resin etc. further and is used for a protective layer may be used alone, or may be used together. [two or more] A protective layer may be structure much more, and may be multilayer structure.

[0049]A metallic oxide film (for example, aluminum oxide film) and a metal fluoridation film can also be provided in an electrode as a protective film, for example. For example, a volume phase (interlayer) which comprises an organophosphorus compound, polysilane, an aromatic amine derivative, and a phthalocyanine derivative can also be provided on the surface of the anode. An electrode, for example, the anode, can also process and use the surface with acid, ammonia/hydrogen peroxide, or plasma, for example.

[0050]Generally, organic electroluminescence devices of this invention can be used also as a pulse drive type or alternating current drive type element, although used as a direct-current drive type element. Generally impressed electromotive force is about 2-30V. Organic

electroluminescence devices of this invention can be used for a panel type light source, various kinds of light emitting devices, various kinds of display devices, various kinds of signs, various kinds of sensors, etc., for example.

[0051]

[Example] Hereafter, although an example explains this invention still in detail, of course, this invention is not limited to these.

The glass substrate which has an ITO transparent electrode (anode) with an example 1 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it bis(2-methyl-8-quinolate)(4-phenylphenolate) aluminum and 7-methylfluoranthene (compound of the illustration compound number 8), From a different deposition source, vapor codeposition (weight ratio 100:0.5) was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was considered as the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of $55 \text{ mA} / \text{cm}^2$ flowed into them. Blue luminescence of luminosity 2250 cd/m^2 was checked.

[0052] In two to example 26 Example 1, instead of using the compound of the illustration compound number 8 when forming a luminous layer, The compound (example 2) of the illustration compound number 11, the compound of the illustration compound number 24 (example 3), The compound (example 4) of the illustration compound number 29, the compound of the illustration compound number 31 (example 5), The compound (example 6) of the illustration compound number 35, the compound of the illustration compound number 39 (example 7), The compound (example 8) of the illustration compound number 46, the compound of the illustration compound number 53 (example 9), The compound (example 10) of the illustration compound number 66, the compound of the illustration compound number 72 (example 11), The compound (example 12) of the illustration compound number 75, the

compound of the illustration compound number 77 (example 13), The compound (example 14) of the illustration compound number 82, the compound of the illustration compound number 84 (example 15), The compound (example 16) of the illustration compound number 91, the compound of the illustration compound number 97 (example 17), The compound (example 18) of the illustration compound number 100, the compound (example 19) of the illustration compound number 104, the compound (example 20) of the illustration compound number 111, the compound (example 21) of the illustration compound number 113, the compound of the illustration compound number 117 (example 22), Organic electroluminescence devices were produced by the method of the statement in the Example 1 except having used the compound (example 23) of the illustration compound number 123, the compound (example 24) of the illustration compound number 141, the compound (example 25) of the illustration compound number 143, and the compound (example 26) of the illustration compound number 145. When the direct current voltage of 12V was impressed to each element under a drying atmosphere, blue - green luminescence was checked. Furthermore the characteristic was investigated and the result was shown in the 1st table (Tables 1 and 2).

[0053]In comparative example 1 Example 1, when forming a luminous layer, without using the compound of the illustration compound number 8, Only using bis(2-methyl-8-quinolate)(4-phenylphenolate) aluminum, it vapor-deposited in thickness of 50 nm, and organic electroluminescence devices were produced by the method of the statement in the Example 1 except having considered it as the luminous layer. Blue luminescence was checked when the direct current voltage of 12V was impressed to this element under a drying atmosphere. Furthermore the characteristic was investigated and the result was shown in the 1st table (Table 2).

[0054]In comparative example 2 Example 1, organic electroluminescence devices were produced by the method of the statement in the Example 1 except having used N-methyl-2-methoxy acridone instead of using the compound of the illustration compound number 8 when forming a luminous layer. Blue luminescence was checked when the direct current voltage of 12V was impressed to this element under a drying atmosphere. Furthermore the characteristic was investigated and the result was shown in the 1st table (Table 2).

[0055]

[Table 1]

第1表

有機電界 発光素子	輝度 (cd/m^2)	電流密度 (mA/cm^2)
実施例 2	2 2 7 0	5 6
実施例 3	2 2 5 0	5 2
実施例 4	2 2 3 0	5 3
実施例 5	2 1 8 0	5 6
実施例 6	2 2 4 0	5 4
実施例 7	2 2 1 0	5 3
実施例 8	2 1 8 0	5 6
実施例 9	2 1 6 0	5 4
実施例 1 0	2 2 6 0	5 2
実施例 1 1	2 2 3 0	5 5
実施例 1 2	2 2 5 0	5 4
実施例 1 3	2 2 3 0	5 5
実施例 1 4	2 2 2 0	5 5
実施例 1 5	2 2 6 0	5 2
実施例 1 6	2 2 8 0	5 4
実施例 1 7	2 3 0 0	5 6
実施例 1 8	2 2 7 0	5 3

[0056]

[Table 2]

第1表 (続き)

有機電界 発光素子	輝度 (cd/m^2)	電流密度 (mA/cm^2)
実施例 1 9	2 2 6 0	5 2
実施例 2 0	2 2 3 0	5 3
実施例 2 1	2 2 4 0	5 5
実施例 2 2	2 2 5 0	5 3
実施例 2 3	2 2 8 0	5 6
実施例 2 4	2 2 3 0	5 4
実施例 2 5	2 2 3 0	5 3
実施例 2 6	2 2 4 0	5 5
比較例 1	1 1 7 0	8 2
比較例 2	1 5 5 0	7 4

[0057]The glass substrate which has an ITO transparent electrode (anode) with an example 27

thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it, from a different deposition source, vapor codeposition (weight ratio 100:1.0) of the compound of bis(2-methyl-8-quinolate)(2-phenylphenolate) aluminum and the illustration compound number 124 was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was made into the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of $58 \text{ mA} / \text{cm}^2$ flowed into them. Blue luminescence of luminosity 2270 cd/m^2 was checked.

[0058]The glass substrate which has an ITO transparent electrode (anode) with an example 28 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it the compound of bis(2-methyl-8-quinolate)aluminum mu-oxo bis(2-methyl-8-quinolate)aluminum and the illustration compound number 131, From a different deposition source, vapor codeposition (weight ratio 100:2.0) was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was considered as the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a

drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of $57 \text{ mA} / \text{cm}^2$ flowed into them. Blue luminescence of luminosity 2320 cd/m^2 was checked.

[0059]The glass substrate which has an ITO transparent electrode (anode) with an example 29 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it the compound of bis(2,4-dimethyl- 8-quinolate)aluminum mu-oxo bis(2,4-dimethyl- 8-quinolate)aluminum and the illustration compound number 108, From a different deposition source, vapor codeposition (weight ratio 100:4.0) was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was considered as the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of $60 \text{ mA} / \text{cm}^2$ flowed into them. Blue luminescence of luminosity 2130 cd/m^2 was checked.

[0060]The glass substrate which has an ITO transparent electrode (anode) with an example 30 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it, from a different deposition source, vapor codeposition (weight ratio 100:1.0) of the compound of bis(2-methyl-8-quinolate)(4-phenylphenolate) aluminum and the illustration compound number 134 was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was made into the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition

(weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of $58 \text{ mA} / \text{cm}^2$ flowed into them. Blue luminescence of luminosity 1970 cd/m^2 was checked.

[0061]The glass substrate which has an ITO transparent electrode (anode) with an example 31 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it, the compound of the illustration compound number 126 was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the luminous layer. Subsequently, it is a 1,3-screw on it. [5'-(p-tert-buthylphenyl)-1,3,4-oxadiazole 2'-yl] Benzene was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 14V was impressed to the produced organic electroluminescence devices, the current of $48 \text{ mA} / \text{cm}^2$ flowed into them. Blue luminescence of luminosity 1740 cd/m^2 was checked.

[0062]The glass substrate which has an ITO transparent electrode (anode) with an example 32 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. First, on the ITO transparent electrode, the compound of the illustration compound number 136 was vapor-deposited in thickness of 55 nm with the evaporation rate of 0.2nm/sec, and was made into the luminous layer. Subsequently, it is a 1,3-screw on it. [5'-(p-tert-buthylphenyl)-1,3,4-oxadiazole 2'-yl] Benzene was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of

magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of 68 mA / cm² flowed into them. Blue luminescence of luminosity 1150 cd/m² was checked.

[0063]The glass substrate which has an ITO transparent electrode (anode) with an example 33 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. It dried using nitrogen gas and UV/ozone wash carried out the substrate further. Next, they are a compound of poly-N-vinylcarbazole (weight average molecular weight 150000) and the illustration compound number 6, and the coumarin 6 on an ITO transparent electrode. ["3-(2'-benzothiazolyl)-7-diethylamino coumarin]" (green luminescent components) And DCM1 ["4-(dicyanomethylene)-2-methyl-6-(4'-dimethylaminostyryl)-4H-Piran]" (orange luminescent components), A 400-nm luminous layer was formed with the dip coating method using the 3-% of the weight dichloroethane solution contained at a rate of the weight ratio 100:5:3:2, respectively. Next, after fixing to the substrate holder of an evaporation apparatus the glass substrate which has this luminous layer, the vacuum evaporation tub was decompressed to 3x10⁻⁶Torr. On a luminous layer, 3-(4'-tert-buthylphenyl)-4-phenyl 5-(4"-biphenyl)-1,2,4-triazole, After vapor-depositing in thickness of 20 nm with the evaporation rate of 0.2nm/sec, further, on it, tris(8-quinolate) aluminum was vapor-deposited in thickness of 30 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of 74 mA / cm² flowed into them. White luminescence of luminosity 1020 cd/m² was checked.

[0064]The glass substrate which has an ITO transparent electrode (anode) with an example 34 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. It dried using nitrogen gas and UV/ozone wash carried out the substrate further. Next, they are poly-N-vinylcarbazole (weight average molecular weight 150000) and a 1,3-screw on an ITO transparent electrode. [5'-(p-tert-buthylphenyl)-1,3,4-oxadiazole 2'-yl] A 300-nm luminous layer was formed with the dip coating method using the 3-% of the weight dichloroethane solution which contains the compound of benzene and the illustration compound number 42 at a rate of the weight ratio 100:30:3, respectively. Next, after fixing to the substrate holder of an

evaporation apparatus the glass substrate which has this luminous layer, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. On the luminous layer, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of $76 \text{ mA} / \text{cm}^2$ flowed into them. Blue luminescence of luminosity 1120 cd/m^2 was checked.

[0065]In comparative example 3 Example 34, organic electroluminescence devices were produced by the method of the statement in the Example 34 instead of the compound of the illustration compound number 42 when forming a luminous layer except having used 1,1,4,4-tetraphenyl-1,3-butadiene. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electric field element, the current of $86 \text{ mA} / \text{cm}^2$ flowed into it. Blue luminescence of luminosity 680 cd/m^2 was checked.

[0066]The glass substrate which has an ITO transparent electrode (anode) with an example 35 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. It dried using nitrogen gas and UV/ozone wash carried out the substrate further. Next, they are polycarbonate (weight average molecular weight 50000) and a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] The compound of biphenyl, bis(2-methyl-8-quinolate)aluminum mu-oxo bis(2-methyl-8-quinolate)aluminum, and the illustration compound number 73, A 300-nm luminous layer was formed with the dip coating method using the 3-% of the weight dichloroethane solution contained at a rate of the weight ratio 100:40:60:1, respectively. Next, after fixing to the substrate holder of an evaporation apparatus the glass substrate which has this luminous layer, the vacuum evaporation tub was decompressed to 3×10^{-6} Torr. On the luminous layer, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of $66 \text{ mA} / \text{cm}^2$ flowed into them. Blue luminescence of luminosity 750 cd/m^2 was checked.

[0067]

[Effect of the Invention]It became possible to provide organic electroluminescence devices excellent in light emitting luminance by this invention.

[Translation done.]